
Call setup sequences in ESN

The following sections describe the various call setup sequences that can occur between conventional PBX equipment and a Meridian 1 ESN node, with emphasis on signaling compatibility. Calls are described (1) to the node, (2) between nodes, and (3) from the node. Several cases are included, reflecting variations, such as the type of machine involved (cut-through or senderized), and whether or not tandeming is involved.

The Meridian 1 PBX without ESN main or ESN node software is treated as a cut-through PBX in the following discussion. The Meridian 1 PBX with ESN main software is not addressed.

Calls to the node

Case 1

This case describes a call to the Meridian 1 ESN node from a telephone at a cut-through main switch.

- The user at the main PBX goes off hook, receives a dial tone from the main PBX, and then dials the network access code.
- The main PBX seizes a tie trunk to the Meridian 1 ESN node and provides audio transmission to the caller. This permits subsequent call-progress tones from the node to be heard by the caller.
- The node returns a dial tone to the caller when it is ready to receive digits.
- The user dials the desired number and, if required, the authorization code. The digits are transmitted to the node as dialed. The node provides an Authorization Code Request Tone only if the authorization code is required. If not, the routing takes place immediately following the last digit of the called number.
- The node proceeds to set up the call.

Case 2

This case describes a call from a cut-through non-senderized tributary PBX to the Meridian 1 ESN node by a cut-through non-senderized main PBX. Whenever practical, a direct trunk group to the Meridian 1 ESN node should be provided to avoid using the main PBX as a tandem switch.

- The user at the main tributary PBX goes off hook, receives dial tone from the tributary PBX, and dials a tie trunk access code to access the main PBX.
- The tributary PBX seizes a tie trunk to the main PBX and provides audio transmission so that tones from the main PBX can be heard by the user, and dialed digits from the user can pass to the main PBX. The main PBX normally provides a dial tone to incoming tie trunks.
- After receiving a dial tone from the main PBX, the user then dials the ESN network access code and the desired number. The call setup proceeds as in Case 1, except that the user's dialed digits and the tones from the node pass through both cut-through switches.

Case 3

This case describes calls from stations at a senderized main PBX to a Meridian 1 ESN node.

- The user goes off hook, receives a dial tone, dials the ESN access code, receives a second dial tone from the main PBX, and then dials the desired number.
- The senderized main PBX does not seize a tie trunk to the node after receiving the access code. Instead, it collects the digits of the called number and seizes a tie trunk to the node. The node does not provide a dial tone.
- The senderized main PBX and the node are mutually arranged to use either a wink start or delay dial signal as a start dial signal to initiate outpulsing.
- When the main PBX receives the appropriate start dial signal, it outpulses the called number to the node and connects the user so that subsequent ringing signals can be heard.

The Meridian 1 authorization code is not supported in this case. The following limitations prohibit the authorization code:

- The senderized main PBX has no provision to provide the authcode request tone for authorization code digits.
- The senderized main PBX does not have the capability to register enough digits for the authorization code and the called number.
- It is impractical to forward additional digits after the senderized main PBX has outputted the called number to the node.

Case 4

This case applies to calls from a cut-through tributary PBX to the Meridian 1 ESN node by a senderized main PBX. This case is similar to calls from a senderized main PBX. The user at a cut-through tributary PBX dials a tie trunk access code to reach the main PBX and receives a dial tone from the main PBX. From this point on, the call is handled as though it originated at the senderized main PBX.

Case 5

This case applies to calls from a senderized tributary PBX to the Meridian 1 ESN node by a cut-through main PBX. This is not permitted because of signaling compatibility problems. The tributary cannot provide the proper outpulsing control for routing the call through the main to the node. Direct trunks must be provided from the tributary PBX to the node in this situation. By definition, the tributary then becomes a main PBX.

Case 6

In this case, both the main PBX and tributary PBX are senderized. This is also not permitted because of compatibility problems similar to Case 5. Direct trunks must be provided to the node from the tributary PBX. The tributary PBX thus becomes a main PBX.

Call completions

Call completions to stations on the node, stations at other nodes, and public network trunks from the node and from the connected nodes are handled in the normal manner.

The node completes calls, by tie trunks to the main PBX, to the following destinations:

- stations at the main PBX
- stations at a tributary PBX connected to the main PBX
- off-network stations by public network trunks terminating on the main PBX
- off-network stations by public network trunks terminating on the tributary PBX

In all cases, call routing to the main is initiated by an off hook signal sent to the tie trunk. The basic sequences for call completion are as follows:

- To reach a telephone at the main PBX, output the Directory Number (DN).
- To reach a telephone at the tributary PBX, output an access code for a tie trunk to the tributary, pause if necessary, and output the Directory Number (DN).
- To reach a public network telephone by a CO trunk terminating on the main, output the access code for the CO trunk, followed by the public network number.
- To reach a public network telephone by the tributary PBX, the node outputs an access code for the main to tributary tie trunk, followed by the access code to the CO trunk, followed by the public network number.

Case 1

This case applies to a call from a Meridian 1 ESN node to a telephone at either a cut-through or a senderized main PBX.

- The node seizes a tie trunk to the main PBX and then pauses, waiting for the main PBX to become ready to receive digits.
- The Meridian 1 then outpulses the telephone Directory Number (DN) digits to the main PBX.

Case 2

This case involves a call from a Meridian 1 ESN node to a tributary PBX by a cut-through main PBX. This is similar to Case 1, except the initial digit(s) outpulsed by the node is an access code for a tie trunk connecting the main PBX to the tributary PBX.

- The node inserts a fixed pause (for a delay for a dial tone) after the access code, unless both main and tributary PBXs are step-by-step (SXS) switches.
- The node resumes outpulsing either when the fixed pause interval elapses or a dial tone is detected.
- The resumed outpulsing is the DN at the tributary PBX.

Case 3

This case involves a call from a Meridian 1 ESN node to an off-network telephone by a cut-through main PBX.

- The access code outpulsed by the Meridian 1 ESN node is for a CO trunk, instead of tie trunk as in Case 2.
- A fixed pause or a delay for a dial tone after the access code is required, even when both the main PBX and the CO are step-by-step (SXS) switches.
- The resumed outpulsing consists of the public network number rather than a PBX number.

Case 4

This case applies when the main PBX is senderized and tandems a call from the Meridian 1 node to a tributary PBX or to a CO.

The beginning of the call setup sequence when the main PBX is senderized is the same as in the previous case. However, once the node begins outpulsing, it outpulses all of the digits without pausing. If the main PBX can receive DTMF digits, outpulsing should be DTMF digits regardless of the capability of the tributary PBX or CO. The senderized main PBX collects the digits, translates, prefixes, and completes the call to the next switch.

Calls to other private networks

Tandem tie trunk networks (TTTN)

Calls to a TTTN are engineered similarly to calls to a main PBX with tributaries. The maximum number of switches connected in tandem is five in a TTTN setup. Thus, up to three access codes with pauses may have to be outpulsed. To avoid the requirement for outpulsing a large number of digits, arrange trunks to several switches in the TTTN so that no more than two trunks in tandem are required to reach any telephone in the TTTN.

Common control switching arrangement (CCSA)

A Meridian 1 ESN node with tie trunks to a CCSA switch is arranged to outpulse seven digits to the CCSA switch to complete network calls to a telephone in that part of the network. Optionally, the Meridian 1 ESN node can outpulse ten digits to complete off-networked calls by the CCSA switch.

Calls from other private networks

A Meridian 1 ESN node is able to function as a TTTN switch for calls from a TTTN. The user in a TTTN dials access codes sequentially to add trunks in tandem.

Calls from a TTTN do not require different engineering than calls from a main PBX, other than a Meridian 1 Route Data Block option to arrange the incoming trunk for TTTN operation. TTTN operation is currently supported by Meridian 1 and is not changed for ESN.

Calls from a CCSA switch can be arranged to terminate on a Meridian 1 ESN node or any other switch that is part of the Coordinated Dialing Plan (CDP). Current Meridian 1 CCSA trunk options can accommodate this. Tie trunks from a CCSA switch must be provided to all switches in the ESN network (including those that are part of the CDP) to be accessible from the CCSA switch. An unambiguous numbering plan encompassing both the ESN network and CSSA must be arranged. The Meridian 1 ESN node routes calls in the CCSA numbering plan to the CCSA switch.

Requirements for dialing pauses

When outpulsing to main PBX and to a TTTN, the Meridian 1 ESN nodes are occasionally required to pause at various points in the digit strings to allow for trunk access and register attachment. Failure to pause causes missed digits and calls to connect to wrong numbers or to be lost altogether.

The Meridian 1 ESN software provides for pauses following trunk access codes in the Network Alternate Route Selection (NARS) translation tables. The general rule is that each trunk access code outpulsed must be followed by a pause. However, there are a number of situations where the pause is not required.

In determining whether the pause is required, you must consider the following:

- what type of PBX is reached in the dialing
- what piece of equipment is accessed

Pauses are not required in the following situations:

- The access code is for connecting a step-by-step (SXS) PBX to an SXS PBX.
- The access code is for connecting a Meridian 1 PBX to any other PBX, providing that subsequent pauses are not required.
- The access code is 9 for a CO trunk by a Centrex PBX, but not to other CO trunks.
- The access code is for an automatic route selection on any PBX.

A potential problem can occur when a trunk access code requiring a pause is made after the call is routed through one or more Meridian 1 switches. While the Meridian 1 ESN node need not pause between access codes for routing through the Meridian 1 switches, if it does not, a problem occurs at the point where the pause is required.

The Meridian 1 switches that are connected insert the proper delay after the access code before resending digits. However, the time spacing between digits is not maintained. The trailing digits “catch up” with the leading digits. The time delay required after an access code is eliminated. To avoid this problem, the Meridian 1 ESN node must insert pauses after each access code for this call routing.

Meridian 1

Electronic Switched Network

Signaling guidelines

© 1982,1994 Northern Telecom

All rights reserved

Information is subject to change without notice.

Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules.

SL-1 and Meridian 1 are trademarks of Northern Telecom.

Publication number: 309-3001-180

Document release: Standard 3.0

Date: December 1994

Printed in the United States of America